Stoller
Grand Junction Office established 1959

GJO-2003-535-TAC

299-W11-56 (A7298)
Log Data Report

Borehole Information:

Borehole: 299-W11-56 (A7298)			**Site:** 216-T-6 Crib		
Coordinates (WA State Plane)		**GWL (ft)[1]:** Not deep enough		**GWL Date:** 10/20/2003	
North	**East**	**Drill Date**	**TOC[2] Elevation**	**Total Depth (ft)**	**Type**
136,661.69 m	567,202.77 m	June 1947	218.065 m	150	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	4.2	8 5/8	7 7/8	3/8	+4.2	143
The logging engineer measured the casing stickup using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated.						

Borehole Notes:

Borehole coordinates, elevation, and well construction information are from measurements by Stoller field personnel, HWIS[3], and Chamness and Merz (1993). Zero reference is the top of the 8-in. casing.

Logging Equipment Information:

Logging System:	Gamma 1E		**Type:** 70 % HPGe (34TP40587A)
Calibration Date:	7/2003	**Calibration Reference:**	GJO-2002-468-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Logging System:	Gamma 1C		**Type:** Planar HPGe (39-A314)
Calibration Date:	04/2003	**Calibration Reference:**	GJO-2003-429-TAC
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	**1**	**2/Repeat**	**3**		
Date	10/20/03	10/21/03	10/21/03		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	143.0	96.0	80.0		
Finish Depth (ft)	81.0	81.0	5.0		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A[4]	N/A	N/A		

Log Run	1	2/Repeat	3		
Pre-Verification	AE053CAB	AE055CAB	AE055CAB		
Start File	AE054000	AE055000	AE055016		
Finish File	AE054062	AE055015	AE055091		
Post-Verification	AE054CAA	AE055CAA	AE055CAA		
Depth Return Error (in.)	-1	N/A	-1		
Comments	No fine-gain adjustment.	Repeat section.	No fine-gain adjustment.		

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2/Repeat			
Date	10/23/03	10/23/03			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	43.0	33.0			
Finish Depth (ft)	25.0	30.0			
Count Time (sec)	300	300			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	1.0	1.0			
ft/min	N/A	N/A			
Pre-Verification	AC079CAB	AC079CAB			
Start File	AC079000	AC079019			
Finish File	AC079018	AC079022			
Post-Verification	AC079CAA	AC079CAA			
Depth Return Error (in.)	N/A	-1"			
Comments	No fine-gain adjustment.	Repeat section.			

Logging Operation Notes:

Zero reference was top of the 8-in. casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 118. Pre- and post-survey verification measurements were acquired for the HRLS in the ^{137}Cs verifier SN 1013. During logging, fine-gain adjustments were not needed.

Analysis Notes:

Analyst:	Sobczyk	**Date:**	11/10/03	**Reference:**	GJO-HGLP 1.6.3, Rev. 0

SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. All of the verification spectra were within the acceptance criteria. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 1.5 percent lower and 4.7 percent higher at the end of each day.

HRLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The spectra were within the acceptance criteria for the field verification of the Gamma 1C logging system (HRLS).

Log spectra for both the SGLS and HRLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to

determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source files: G1EJul03.xls and G1CApr03.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 8-in. casing. On the basis of Chamness and Merz (1993), the casing configuration was assumed to be one string of 8-in. casing to the maximum depth of the logging (143 ft). The casing correction factor was calculated assuming a casing thickness of 3/8 in. This casing thickness is based upon the field measurement. A water correction was not required.

Dead time corrections are applied when dead time exceeds 10 percent. Dead time exceeded 10 percent in the interval from 23 to 46 ft. Maximum dead time was 97 percent at 31 ft. At SGLS dead time greater than 40 percent, peak spreading and pulse pile-up effects may result in underestimation of activities. Dead time exceeded 40 percent in the interval from 27 to 42 ft. This interval was logged with the HRLS.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. In addition, a comparison log plot of man-made radionuclides is provided to compare the data collected in 1995 by Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. ^{137}Cs was detected in the intervals from 6 to 65 ft and from 133 to 143 ft at concentrations ranging from the MDL (0.2 pCi/g) to 7,100 pCi/g. The maximum concentration of ^{137}Cs was measured at 31 ft. ^{137}Cs was also detected near the MDL at 75 ft, 89 ft, and 127 ft.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS and HRLS data for both the man-made and natural radionuclides (661, 609, 1461, 1764, and 2614 keV). The ^{137}Cs concentration based on the SGLS's 661-keV photopeak did not repeat at 89 ft.

Gross gamma logs from Fecht et al. (1977) (attached) indicate that the sediments surrounding this borehole contained significant amounts of gamma-emitting contamination as early as 1963 and through at least 1976. The logs from 4/26/63 and 5/6/76 detected significant amounts of gamma activity in the interval from 13 ft (4 m) to 52 ft (16 m). The SGLS detected ^{137}Cs at concentrations greater than 10 pCi/g between 20 and 54 ft.

Comparison log plots of data collected in 1995 by Westinghouse Hanford Company (WHC) and in 2003 by Stoller are included. The WHC concentration data for ^{137}Cs are decayed to the date of the SGLS logging event in February 2003. Comparison of the ^{137}Cs concentrations indicates differences in apparent concentrations occur in the interval from 31 to 34 ft. RLS data appear to underestimate ^{137}Cs concentrations in this interval because the RLS sonde was saturated. Since 1995, ^{137}Cs activities have changed as predicted by radioactive decay.

References:

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, Pacific Northwest Laboratory, Richland, Washington.

Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

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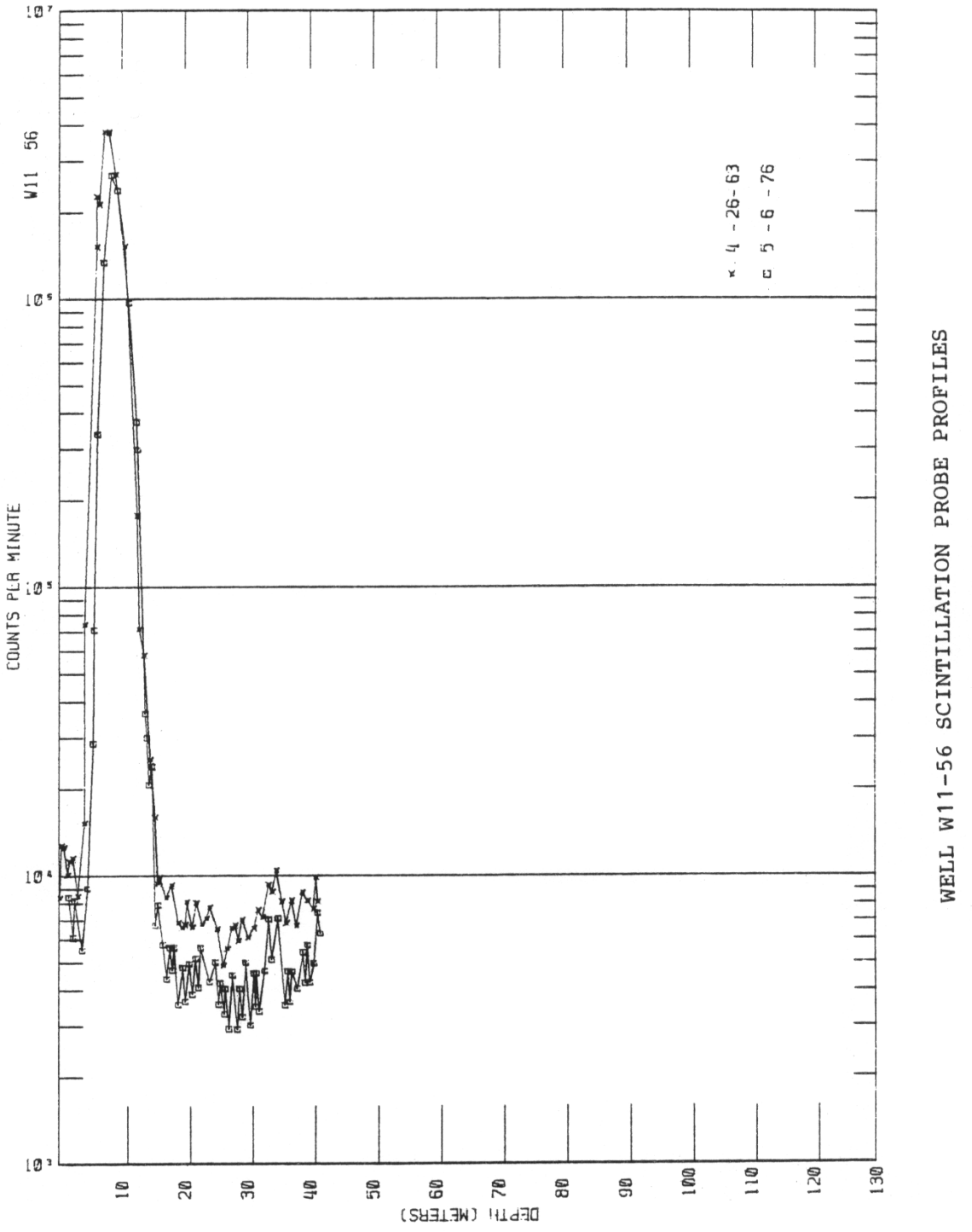
[1] GWL – groundwater level
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable



from Fecht et al. (1977)

Scintillation Probe Profiles for Borehole 299-W11-56, Logged on 4/26/63 and 5/6/76

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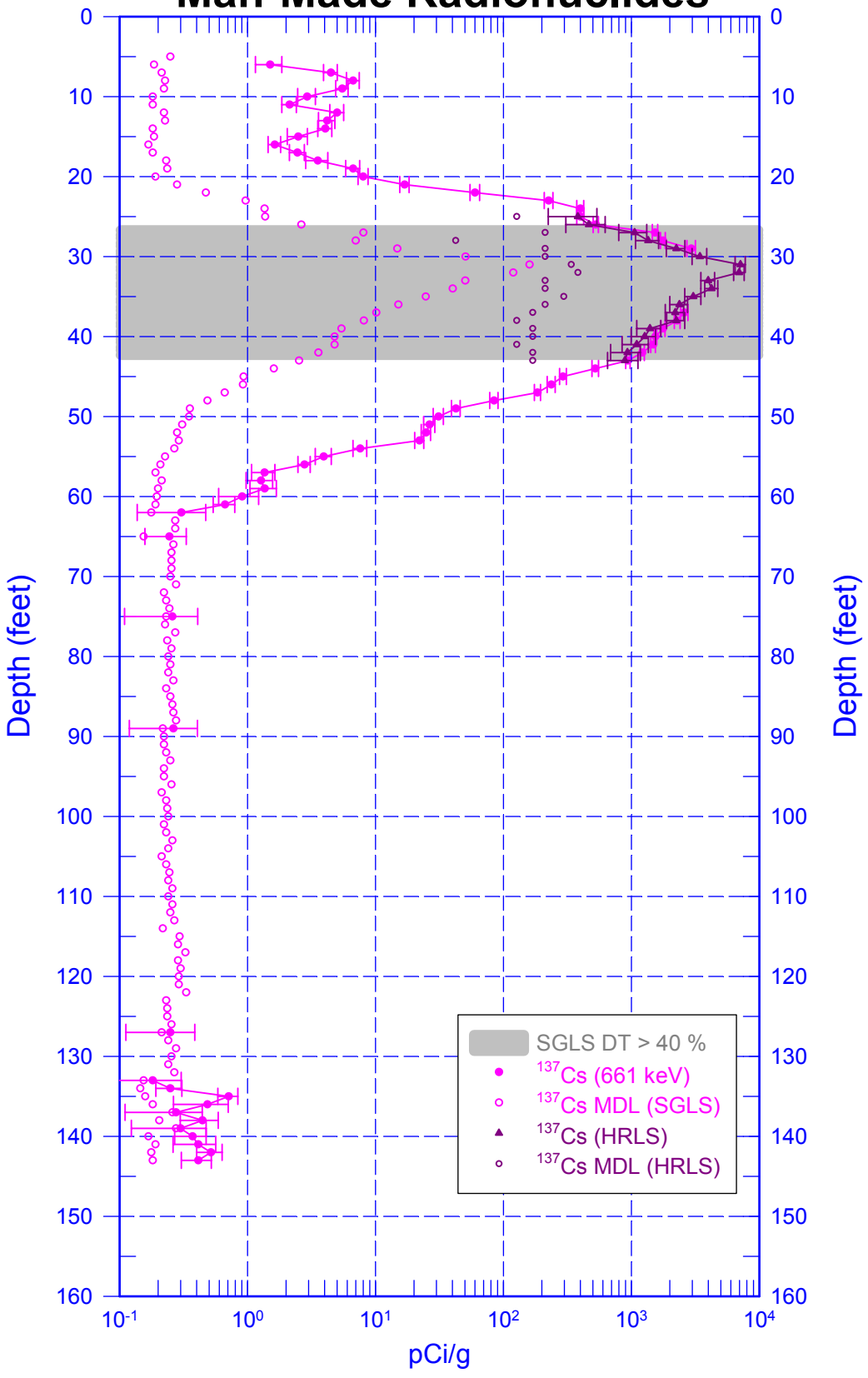
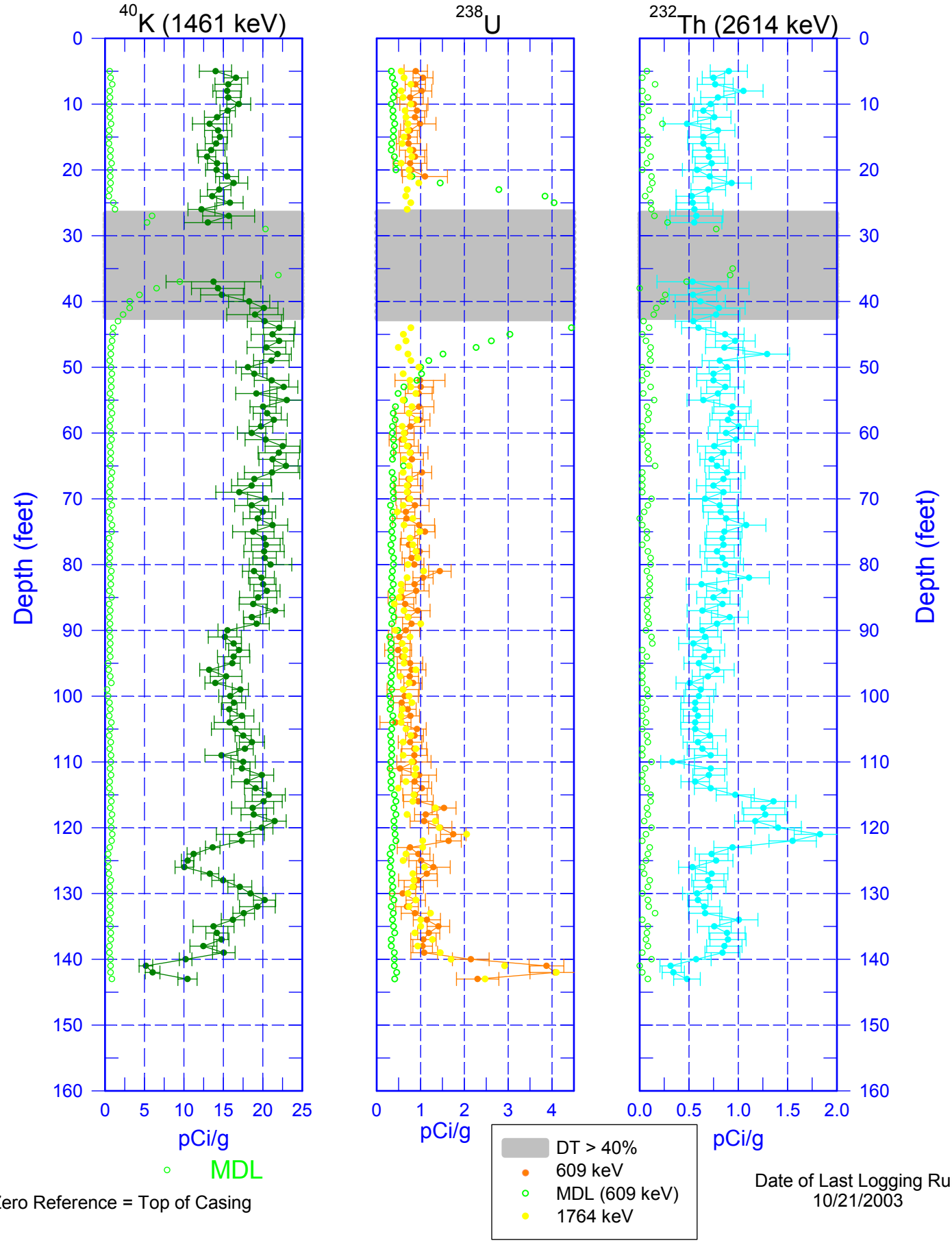
Man-Made Radionuclides



Zero Reference = Top of Casing

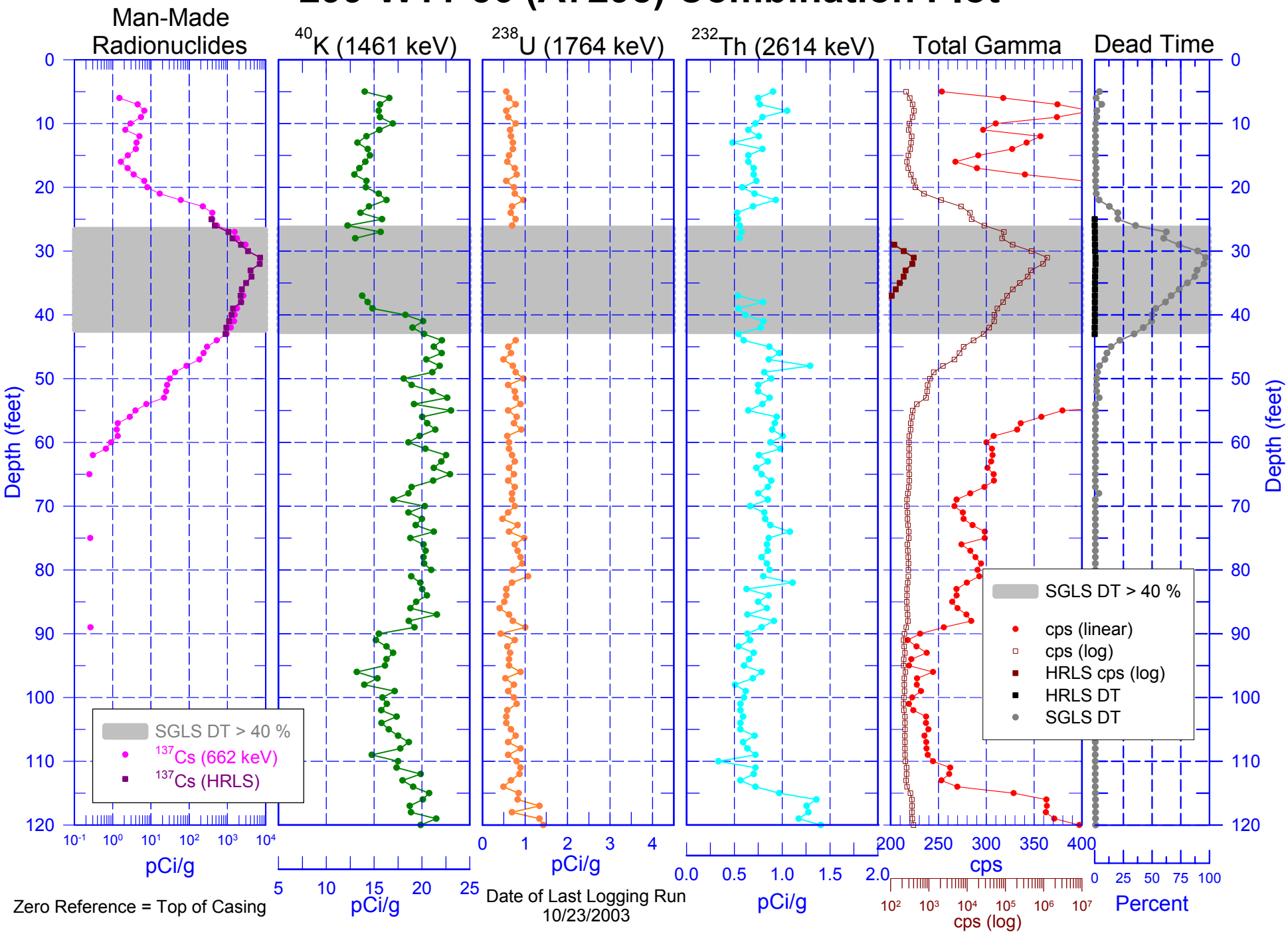
Date of Last Logging Run
10/23/2003

299-W11-56 (A7298)
Natural Gamma Logs

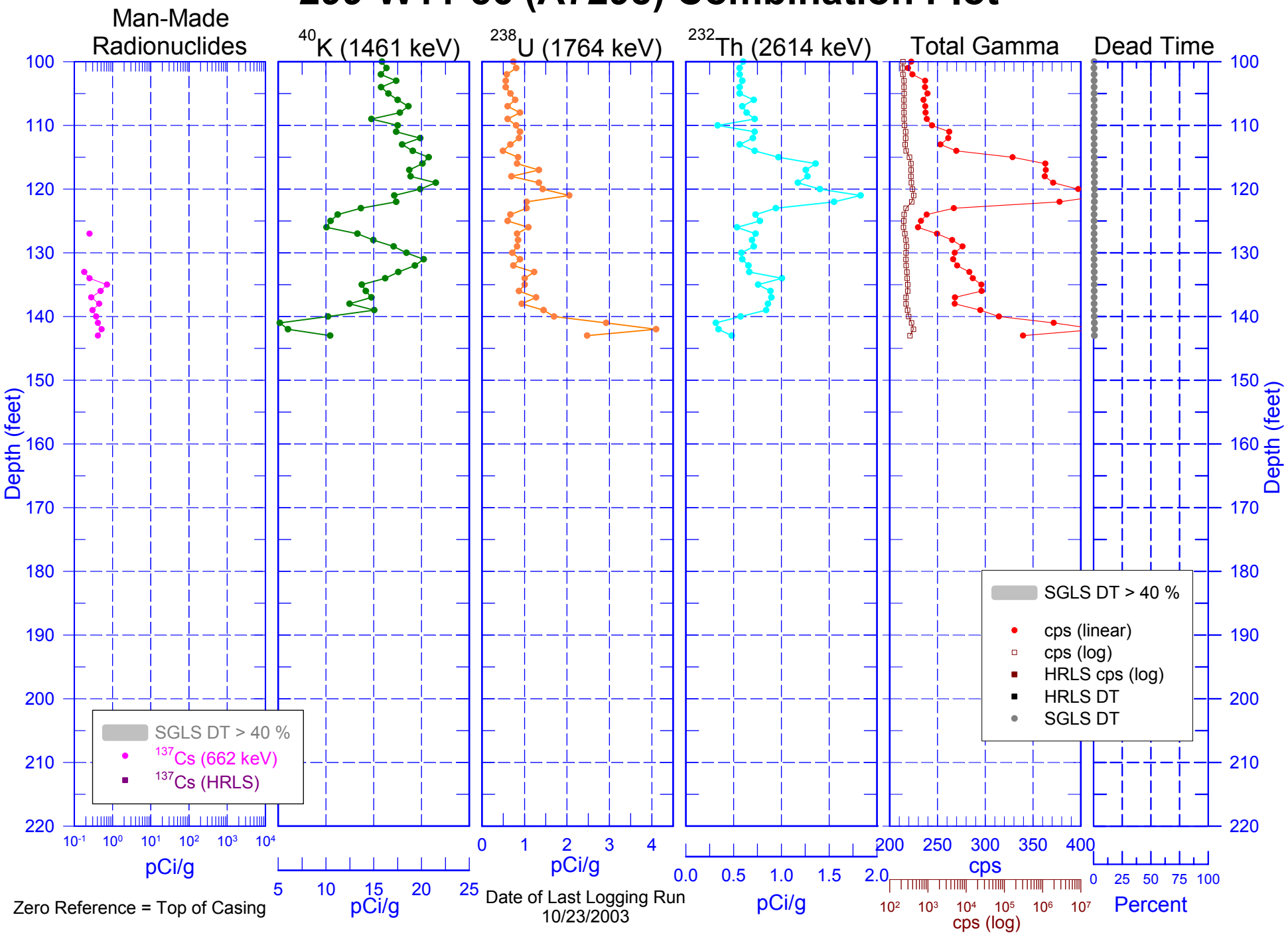


Zero Reference = Top of Casing

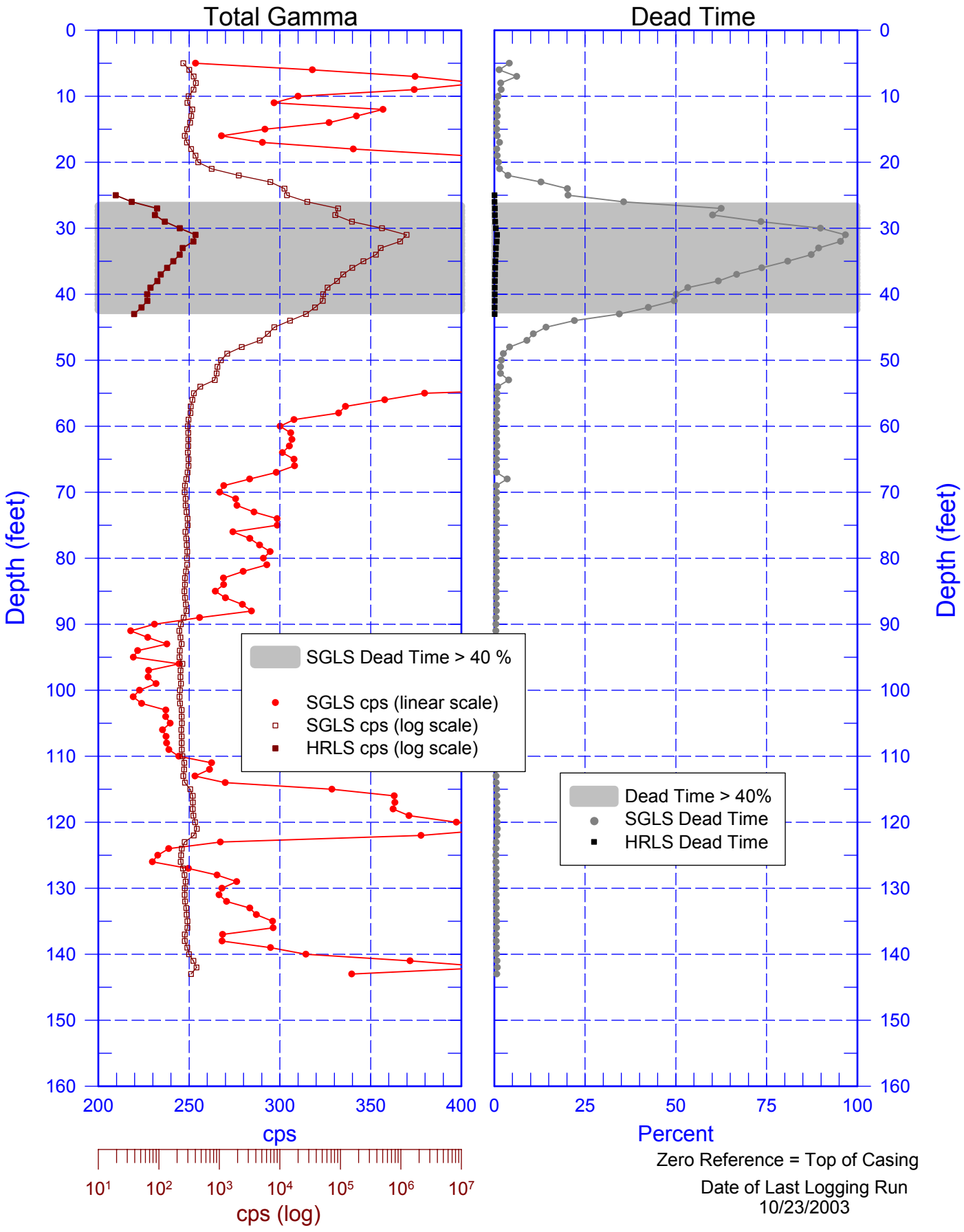
Date of Last Logging Run
10/21/2003


299-W11-56 (A7298) Combination Plot
Man-Made Radionuclides
40K (1461 keV)
238U (1764 keV)
232Th (2614 keV)
Total Gamma
Dead Time
Depth (feet)
SGLS DT > 40 %
137Cs (662 keV)
137Cs (HRLS)
pCi/g
SGLS DT > 40 %
cps (linear)
cps (log)
HRLS cps (log)
HRLS DT
SGLS DT
cps
cps (log)
Percent
Zero Reference = Top of Casing
Date of Last Logging Run
10/23/2003

299-W11-56 (A7298) Combination Plot



299-W11-56 (A7298)
Total Gamma & Dead Time



Zero Reference = Top of Casing

Date of Last Logging Run
10/23/2003

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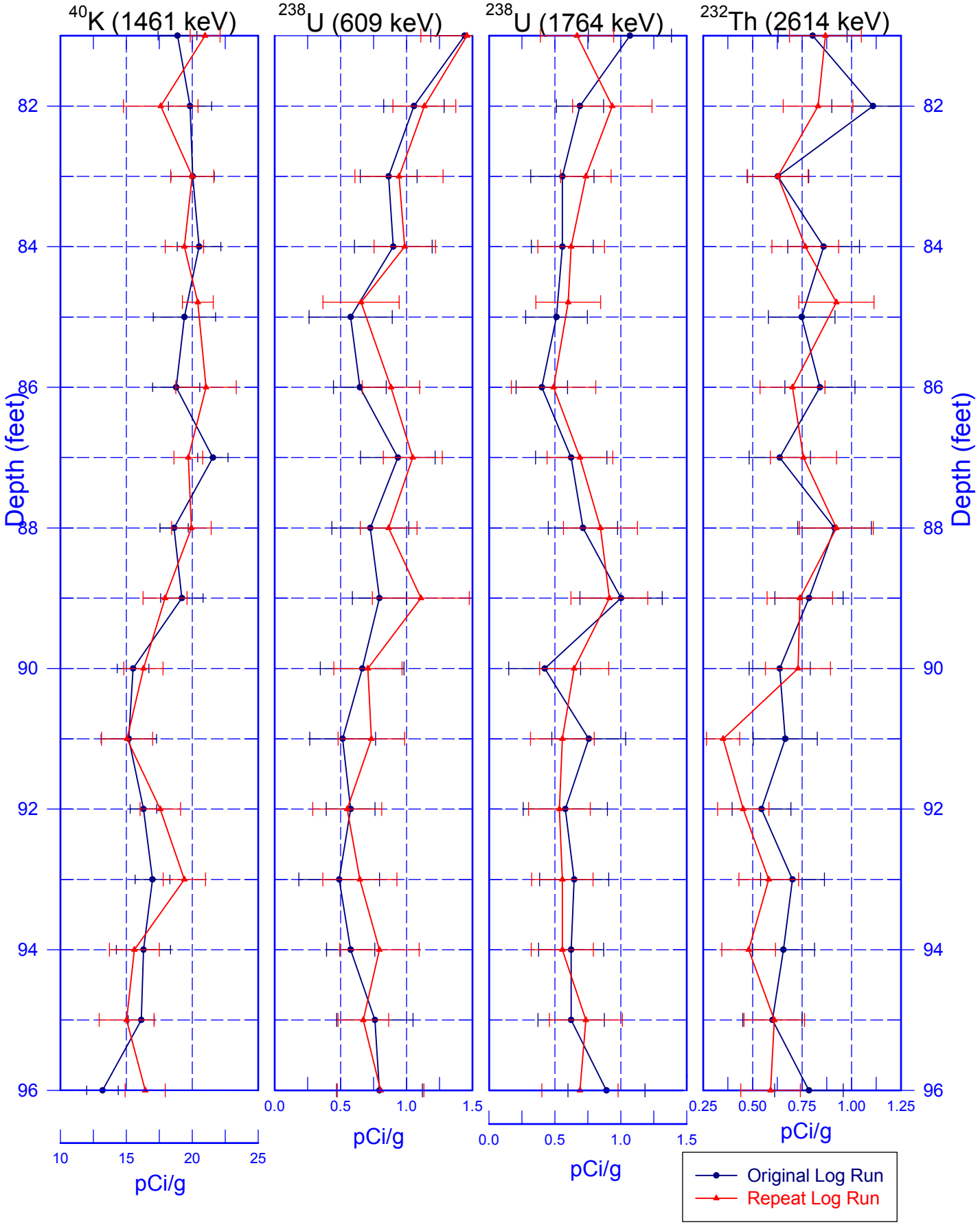
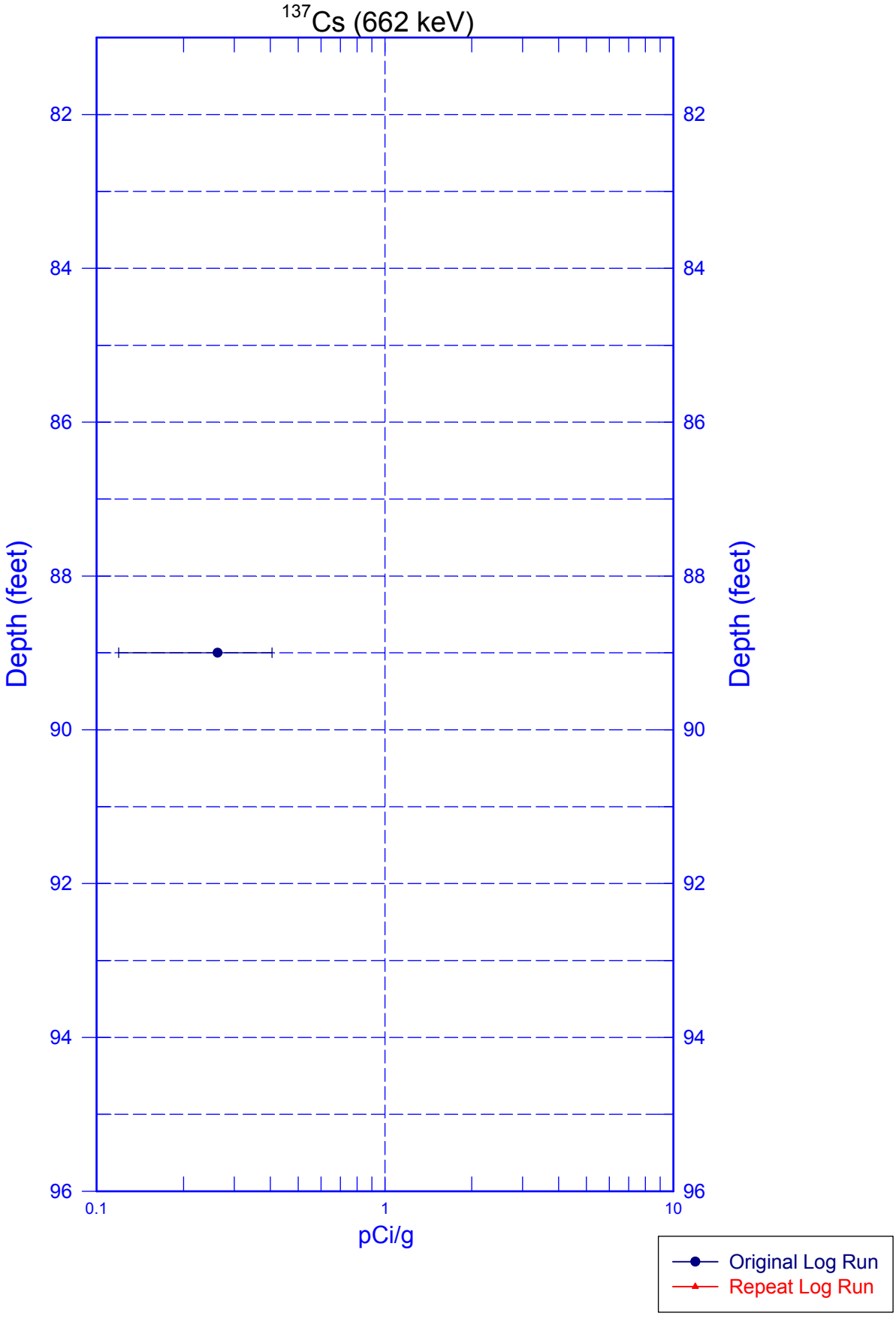
Rerun of Natural Gamma Logs (96.0 to 81.0 ft)



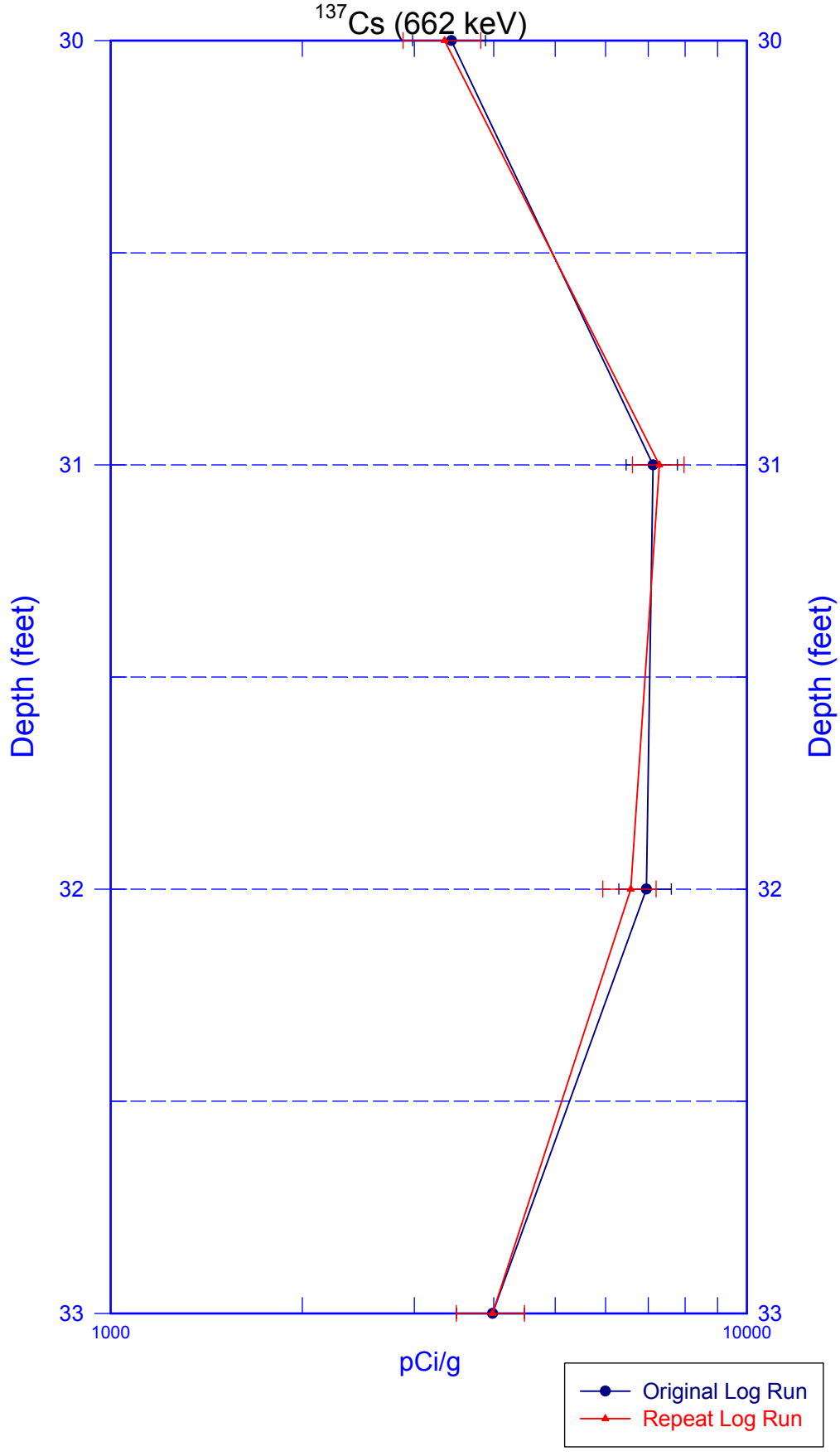
299-W11-56 (A7298)

Rerun of Man-Made Radionuclides (96.0 to 81.0 ft)



299-W11-56 (A7298)

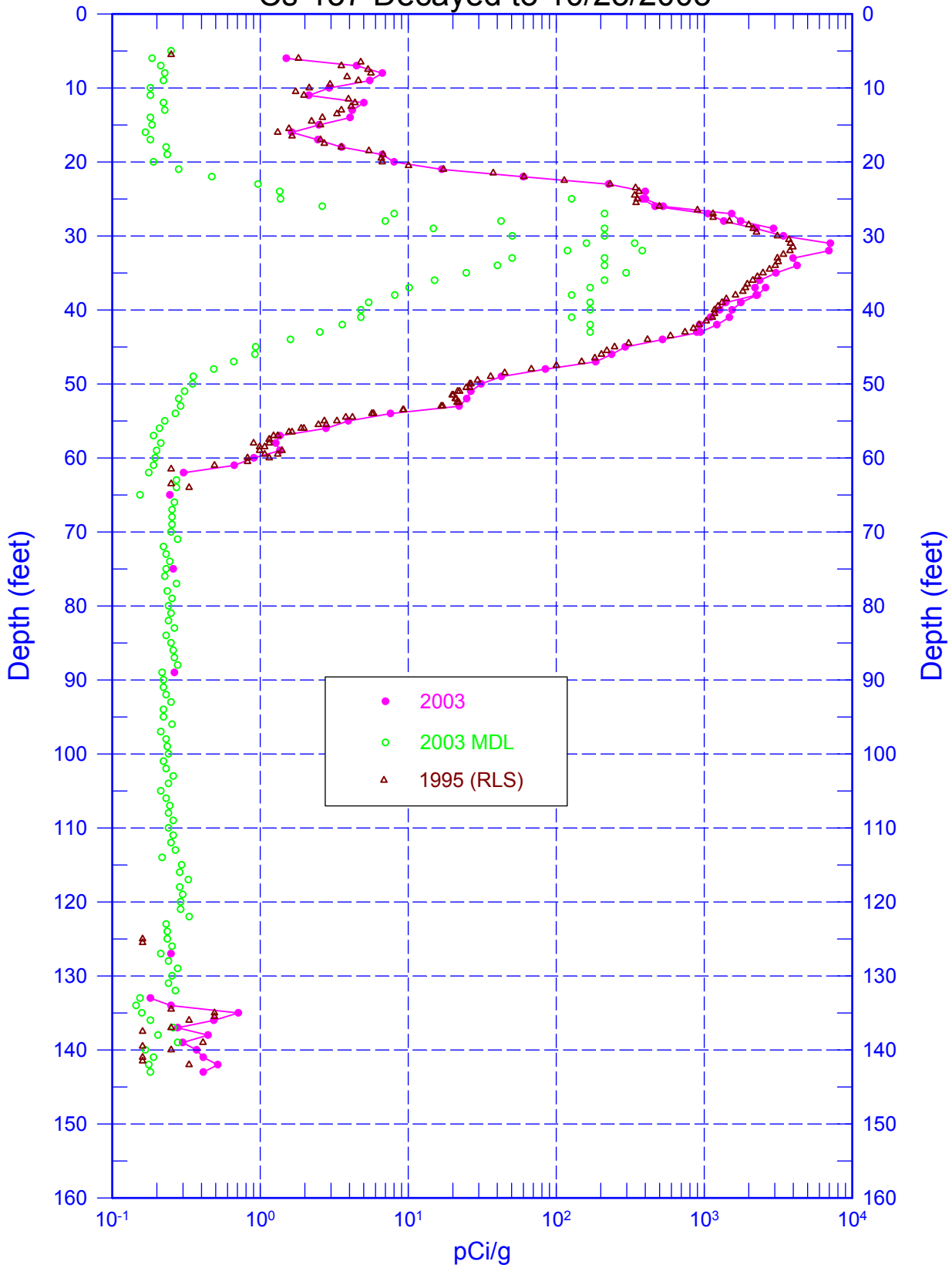
Rerun of High-Rate Man-Made Radionuclides (33.0 to 30.0 ft)



299-W11-56 (A7298)

RLS Data Compared to SGLS Data

Cs-137 Decayed to 10/23/2003



Zero Reference = Top of Casing (2003 SGLS & 1995 RLS)